

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JAN. 14, 1952

50 CENTS



Specially equipped to strike through fog and darkness

The elaborate radar gear of the Northrop Scorpion F-89, the Air Force's top all-weather jet interceptor, makes it possible to shoot down enemy aircraft never even glimpsed.

The fog and darkness that hamper ordinary fighter operations can't stop the pilot of the F-89. Because after an intruder has shown up clearly on his radar screen, automatic tracking equipment takes over and, together with the computers, quickly tells him in which split second to fire—for a direct hit.

Playing an important part in the tracking operations are extremely sensitive rate gyros. Now being mass produced for manufacturers of radar search equipment, this small Honeywell gyro recognizes the rate of target motion and stabilizes the antenna "on target." It is light enough and compact enough to be mounted on the antenna. And another Honeywell gyro

development for radar tracking equipment—the "twin-spin"—soon will be in production for non-antenna mounting.

Honeywell, one of the leading gyro manufacturers, specializes in this important field.

And Honeywell engineers will continue to experiment, improve and find new applications for gyroscopic controls. We plan to broaden our research in this and other fields of control—because *automatic control* is such an important part of aviation progress. And *automatic control* is Honeywell's business.

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4 hot ideas for fighting ice

The pipe that flies like a plane. Boeing's new Flying Boom for in-flight refueling (upper left) is actually flown into place by means of reshaped end-fittings. To provide sensitive control, these end-fittings had to be precision ground too. B. F. Goodrich developed special electric rubber pads for the leading edges that supply spot anti-icing heat.

Blower blankets keep new Arctic planes from freezing. Designed for Arctic ozone work, Northrop's new C-125 (upper right) had to have ice protection in all vital spots. BFG electric rubber "blankets" warmed the cockpit for three-man—remote unit, electric heat, and air sweeps. Because of the design flexibility of electric rubber, wide varia-

tion in the shape of these three parts proved no obstacle.

Keeps ice from choking jet's throat. Ice forming in the narrow "throat" of a jet engine intake could choke off the air supply, make the engine quit cold. This threat has been eliminated on North American's B-47 (lower left) with a special lining of BFG electric rubber inside the cowling.

Rubber makes propeller stretch. To help BFG engineers adjust fuel supply for maximum efficiency, a hydrostatic free transducer propeller load is an automatic pencil dial. But cold was complicating the job, causing false readings. BFG engineers dissolved the hydrostatic line in electric rubber to keep

the dial fluid, urea propylene. This heated line is now standard on TWA Coast-to-coast (lower right).

B. F. Goodrich electric rubber is tough, this rubber with a core of transducer wires that provide spot heat precisely as needed. Two lead wires attached to the stepless's regular power supply are the only other equipment required. Electric rubber can be made to be any size, any shape, replace part. For help with your problem write to The B. F. Goodrich Company, Automated Division, Akron, Ohio.

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Aviation Week

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Aviation Week is served by Press Association, Inc., a subsidiary of Associated Press

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Subscription rates: \$5.00 per year in advance, \$10.00 per year in arrears.

Single copies: 15¢ each.

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Printed in the United States of America.

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NEWS DIGEST

DOMESTIC

DC-6A scheduled cargo service was slated to be inaugurated between New York and San Francisco, Puerto Rico, St. Paul, Sacramento, Wichita, Kansas City, and other points listed from St. Louis. The new service, into Europe, to the U. S. to the Caribbean and to South America since it has in with FAA's DC-6A cargo was expected to Europe Jan. 5. Latest news, leaves New York on Thursday, Puerto Rico on Friday.

First production A-1E Corsair, designed for ground support, has been flown by Chance Vought Delta 500 to the Lockheed F-104, the new A-1E has a single-stage P-6W R-2600, additional armor plate to protect pilot from ground fire, and a number of structural modifications. More than 12,000 Corsairs of all models have been built since the first prototype.

Capt. John R. Popper, Medical Corps, USN, director of the Navy's medical aviation laboratory at NAFD, Jacksonville, Fla., has ordered those active duty. He had done much in development of pilot ejection seats, anti-ejection seats, G-suits and other aviation medicine research.

Civil aircraft shipments rose to 277,540 in last October, compared to 270,000 in September. Total scheduled 124 planes, valued at \$18.8 million. Backlog of planes, 3,800 in and over, rose to 750 at the end of the month. During October, 345 engines exceeding 700-800 hp. were shipped. Aircraft plant employment was 731,108; workers in engine plants 69,490.

Frederick A. W. Stiller, 36, has been named, member public relations director of Aircraft Industries Association, in charge of the western office, as a member of the Los Angeles staff of AIA & Aviation, Inc. Stiller has served director of public relations for Bell Aircraft Corp. Stiller, a pilot and has been active in California civil aviation affairs. He attended Keweenaw College and Tufts College, and is a chemical and mechanical engineer. He attended Gortler Laramie who resigned from the AIA public relations post.

Off Robb Wilson, aviation columnist for the New York Herald Tribune, has joined Flying magazine as editor and publisher. World War I pilot, one of the organizers of the Civil Air Patrol. Wilson also helped establish the National Association of State Aviation Officials and the American General

Pilot Association, was first president of the National Aeronautics Association.

FINANCIAL

National Aviation reported a net income of \$123,200 after taxes for last November, a 12.5% gain over the same period the previous year in spite of increased taxes. Total operating revenues during November were \$2,282,456, a 15.1% gain over the same period in 1950. Costs had declined 25cent dividend to stockholders of record Jan. 14.

Mohr Aircraft Corp., Chula Vista, Calif., had net sales of \$76,723,549 for the third year ended July 31. Net profit was \$963,107. Employees were 1,800 working over \$100 million.

East, Inc., Coral Gables, Fla., called 1951 with shipments, value \$125 million, a 16.1% increase over 1950. Current backlog at about 540 million.

Wilcox Mfg. Co., Los Angeles, had gas turbine engine backlog booked to reach 578 million when they received additional \$21 million order for ship power systems to drive generators on the Marine PDM-1. Martin and Chance Vought F7U Corsair.

Delta Air Lines reported 1951 operating profit estimated at \$4,585,000, more than double 1950, with net profit after taxes of \$1,926,000 compared with \$1,047,000 in 1950 or 35.5% — down compared to 32.2%.

INTERNATIONAL

Canadian government placed \$1,385,000 worth of aircraft parts and accessories contracts during the first two weeks of November, with largest single order going to the Hamilton Aircraft Co. Canada, 146. Twenty-five engine and airframe spares amounting to \$1,412,000.

British Commonwealth Pacific Airlines path, owned by British, Australian and New Zealand governments, has received approval of all three to purchase an 180 Corvet jet engines for its trans-Pacific services connecting Australia and New Zealand with the U. S. and Canada. The BCPA planes will probably be four-engine B-707s. B. Corvet seating 44 and delivery will be in 1954-1955. Order will come to \$5.5 million without spares or equipment.

Sixth D-11 Corvet made its first flight at Hatfield on Dec. 31.

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WHO'S WHERE

In the Front Office

Arthur F. Flood has been elected executive vice president of Fairchild Engine & Airplane Co. A Detroit, Flood will also continue to serve as company controller. He has been with the firm since 1935, was made vice president/controller in 1949 during a management reorganization.

F. E. Wood has been appointed administrative assistant to the president of Trans-Canada Air Lines. Formerly director of facilities and supply control. Wood joined TCA in 1947 as secretary in the vice-pres office.

E. V. Rappaport, president and general manager of General Motors Diesel Ltd., London, Ontario, has been named director of the Canadian Diesel Engine Division of Detroit Diesel Engine Co., Detroit.

Changes

Edgar H. Adams, formerly chief engineer for Inco Canada, has been named the newly created post of technical director of the Aircraft Division. **James C. Ford** steps up to become chief engineer and **Thomas E. Whisman** becomes chief manager. **Fred T. Jones**, a director of the company, has been given a newly created position that of vice president and manager of the Aircraft Division.

C. F. Gandy has been designated assistant to the manager of Inco Canada, Inc. **Donald Decker** has been named to assist the company's director of commercial sales manager. **J. R. McGehee** has been appointed chief project engineer on the Ford and G. E. 5000 cc. V-8 engine created when **J. R. Edwards** left to become chief engineer for Volvo High Motors.

M. A. Wachter has been named division manager manufacturing with Pacific Airplane Corp., with **D. R. Whitman** appointed as its assistant.

Bill Salovey has been designated public relations administrator for Pacific Helicopters Corp., Victoria, B. C.

W. T. W. Bellhouse, formerly SNA representative in South America, has joined Vought-Sikorsky Division to act as liaison with firms among these two companies.

Willis P. Dinkels has been appointed as chief manager for the firm, **Archer R. Bailey** has been named CAA's regional office. He has been made executive assistant to the vice president.

Donald R. Williams, previously with NACA, for eight years, has been appointed as the engineering and maintenance staff of the United States.

Fred Korman, previous has joined Northeast Airlines publicity department and vice president in St. Paul, Minn.

J. R. Williams has been promoted to superintendent of defense for VBAmerican Airlines and **L. B. Sprue** has been named assistant director of systems for VAA.

John S. Reed has been designated director of personnel for Pacific Northwest Air Lines.

INDUSTRY OBSERVER

► Dynamic lateral stability may mean greater than normal is not to be provided, with no controllability loss, through the use of a new independent stability augmentation device developed by Northrop Aircraft Inc. for incorporation on its F-89 Scorpion all-weather fighter. Device uses a low bandwidth accelerometer to measure roll force on the aircraft. An electric valve directs the aileron to neutralize the side force. It is said to make possible coordinated diving or slow turns without loss of control. However, full aileron is available for deliberate rollings. Device is considered an answer to the lateral motion known as Dutch Roll, without increasing use of the plane's roll. Result is a steadier aerial platform for pilot or gun firing. Device already has been flight tested at Edwards AFB on the F-89.

► General's YB-40 winging night development from the B-36 design and complete to the XB-32, approximately about the same amount of improvement is used in the current B-45D, approximately 9,000 lb.

► Although the USAF has the McDonnell XP-55 private fighter project in the head sometime back, it has not yet gone up the concept of producing its language hardware from center attack. Current planning centers around long range jet, heavy transport or logistic carrier planes, capable of carrying, launching and recovering possible fighters to accompany bombers over enemy territory. The program would provide a screen for both the bombers and fighters.

► Our Air Force view on these German deep penetration being brought to the U. S. after the end of World War II. The U. S. is much better off in three years, even if they were never used, than for them to have fallen into hands of the Russian aircraft industry. Russians get other German deep process, which they have been using.

► USAF researchers are now talking about heavy "logistics aircraft" to provide logistic support for all Air Force operations, thus making every thing they need by USAF in the field completely air transportable. Planes in the 400,000 lb. gross weight category capable of carrying 100,000 lb. payload, with wings of approximately 1,500 sq. ft. and cruising at speeds nearly double those of today's military transport are in planning stage. Possibly the proposal by General for a winging version of the XC-119, with eight turbojets or eight turbojet engines, (Armstrong Whittle No. 5, 1951) would come close to this performance.

► Proposal of the Civil Aeronautics Board to use an automatic process failure indicator with selective propeller feathering in the refueling operation to prevent automatic feathering without the propellers has been reduced by the Transport Airworthiness Requirements Committee of Aircraft Industries Association.

► Warning of ending relations between the Civil Aeronautics Board and the U. S. industry is seen in the disclosure that several of the cost companies have recommended to AIA that any future annual industrial CAA certification meetings be deferred until the Board takes official action to adopt the set of regulatory principles for aircraft agreed to by its industry and CAA technical representatives meeting last August.

► U. S. Coast Guard now has about five of the new larger Sikorsky 345 rescue helicopters in service and it is said to get four more soon.

► Curtiss Wright Corp.'s CW-40 helicopter has been moved from Dearborn, Mich., airport to the company's propeller division site at Caldwell, N. J., for further development and modification work directed necessary. This is to effect make a complete redesign of the main rotor. Downer Helicopters, Inc., which designed and built the rotor in the E-2 and first test in Nov. 11, 1950, at Dearborn Airport. Curtiss Wright purchased the rotor in January, 1951. Third July it was flight tested by C.W. personnel at Dearborn, then went into Downer's shop for development changes. It was test flown again during November, and on Dec. 1, the latest arrangement with Downer was completed. An future development work in modification will be Curtiss Wright's independent effort, Downer has announced.

More Money Slated for Transport Safety

- Plans stress equipment, training, maintenance.
- But some suggestions may stir controversy.

By F. Lee Vroom

Airlines and civil aviation officials will be to shift their 1992 budgets to get more emphasis on aircraft improvement of air transport safety. This is because the scheduled airline safety record of 1991 barely equaled 1990, and the non-scheduled lines had a surge and disaster rate at 41.46 accidents of the year-end, among commercial heavy-air crash pollsters.

Unofficial estimates place 1991 passenger fatalities at about 1.3 per 100 million miles for the scheduled lines (about the same as the year before) and 7.4 for the non-scheduled (almost double the year before, despite a perfect 1991 record for Northwest).

■ **1992 Safety Programs**—Main phases of the attack, planned against airline accidents are airline safety equipment, buying CAA ground equipment, new regulations, airline pilot training and selection, and airline and CAA maintenance checks.

Here's a tally of projects cited to American Ways to pilots, airline crew, airlines and civil aviation officials: **CAA**—diverting more money than has been previously, budgeted by airlines and CAA if they're to get to next equipment state in safety.

■ **Aviation flight equipment**—Turbine engine and/or fuel line, engine oil and oil separator, glass flight surfaces and (for some transports) severe prop pitch and/or larger starters require new and/or improved testing devices like the Ithaca.

■ **Airline navigation aids**—Automatic pilot with auto approach complex, dual instrument receiver on air, or air or dual DME, integral receiver on air, or receiver of CAA testing center (full) be made, for airline procurement before CAA has installed receiver DME.

■ **CAA inspection methods**—Voice identification of engine and main, even in slow-engine phase (revolutions) encourage auto-failure (the both CAA and airlines) improved light reference (glass pilot) ILS now being installed (ground) under traffic control in all



CAA CHAIRMAN Donald Nym (pointing) and William K. Andrews, director of CAA Bureau of Safety Investigation, inspect wreckage of a C-46 near Little Valley, N.Y.

vinebreak or ship, at Washington, National Airport, standardized approach light system, weather service equipment and technique traffic control data, com platform and display equipment and technique.

■ **Airline pilot training**—Airlines, CAA and the pilots themselves are to emphasize need to follow approved standard procedures, auto-out play around with personally developed check, com. Practice of com that one third and answer to a standard checklist leads to confusion when computer conditions may vary. Airlines and CAA are exchanging pilot check programs.

■ **Maintenance**—CAA is introducing maintenance and operations (regulation of airlines generally) autocheck. And CAA is expected soon to leave the full 100-hour test load at the C-46 for passenger flight.

The above tally lists the key central areas programs to be tested. The same outline is more.

Then here are some new controversial equipment recommended to Air-

line WAA by some pilot, airline officials and civil aviation officials: **CAA**—background testing of passengers is identical, auto and para a better view, but which airlines require as grounds of passenger psychology.

■ **CAA**—background testing, which is acceptable to some pilot long be less, the plane does, and can do the job as an airplane approach glass path under approach.

■ **Flight accident** is historic site of CAA (non-scheduled) for spot check, on pilot accounts and discipline, but which airlines and pilots oppose because of complexity, cost and other reasons.

■ **Flight accident**, which is seen as a fact and about 4000 feet, but Navy now has a heavy development program and funds, has arrived at an improved version.

■ **Flight**, airborne radar and improved airborne pilot equipment to radio and altitude are in development but will not be ready for airline presentation for some time.

■ **Cockpit** Vectors—More airline and government, accident officials for most of the time for accidents on

plot error. But the pilots point out that in almost every single crash the "error" needed loss of cockpit instruments. The accident pile up all at once on a pilot to cause an accident. Better equipment can simplify the pilot's job, the pilots say.

Pilots say they are always going to be human and probably will run into potentially fatal difficulties at least every million miles.

■ **Basic Airways**—Equipment support cost in the broader sense toward after airline thing, this point out. What's plus is usually recommended in more airline and CAA money and management attention on improving it. Reduce, simplifying cockpit layout and equipment, developing more personal risk symbols instrument and control display and designing life safety equipment and standard equipment in case of failure of the primary equipment.

Some pilots see airborne radar to the No. 1 development program needed. And they see two big obstacles to what they consider many budget increases for safety improvement of air line and ground equipment: airlines fear that they are taking money, are putting it into buying new planes to make more money, local compensation, and that's why they're not going to CAA on airports, but not on airports too.

■ **Non-scheduled Airline**—The non-scheduled C-46 operators are now making some loss of business directly attributable to the public, given their year-end accident losses. Here is why.

The Dec. 16 scheduled C-46 crash at Elizabeth, N.J., killed 50, second worst U.S. airline error in history. The Dec. 20 scheduled C-46 crash at Little Valley killed 34, with 14 survivors under dramatic circumstances, both were non-scheduled C-46s, both occurred in a two-year period around the Christmas holiday season, three more seriously non-scheduled crashes, two of them with C-46s, occurred in the November-December period.

Then all across while CAA non-scheduled reducing the allowable gross load of the C-46, as CAA Chairman Donald Nym explained at a press conference at the Little Valley, N.Y., crash scene. Nym made his unprecedented flight to the scene from Washington while bodies were being removed and all 64 survivors were still in the local hospital.

■ **Taxable Aircraft**—The scheduled C-46 operators are expected to run into some business problems when CAA comes out with an expected gross weight reduction order on C-46 passenger operators. This would cut payload of the plane and/or force some loading stop on route.

Meanwhile, CAA Safety Director

Fatal Airline Crashes in 1991

Here is the record of fatal U.S. airline crashes last year, listing the location of crash, aircraft type, flight, date, time, plane, crew and passengers killed, accident cause (with cause), but excluding contributing causes, and finally airline or government action taken.

■ **Philadelphia, IFR clearance**, over the harbor, scheduled traffic, National Airlines, passenger flight, Jan. 14, DC-3 transport, 1 crew and 6 passengers, crashed glide in approach (CAA).

CAA suggested that CAA review and adjust pilot flight plan on approach.

■ **San Jose, IFR clearance**, scheduled to earth, scheduled traffic, National Airlines, passenger flight, Jan. 16, Martin 202 transport, 3 crew and 7 passengers, rolled into ground for unknown cause (CAA).

■ **San Jose, IFR clearance**, failed in fuel approach, scheduled traffic, National Airlines, passenger flight, Apr. 6, DC-3 transport, 1 crew and 39 passengers, rolling into ground for unknown cause (CAA).

Airline and CAA is emphasized pilot training in ground operations.

■ **San Jose, IFR clearance**, failed in fuel approach, scheduled traffic, National Airlines, passenger flight, Apr. 6, DC-3 transport, 1 crew and 39 passengers, rolling into ground for unknown cause (CAA).

CAA suggested that airline not put in such judgment on its own judgment as that pilots take shortcuts on route to make up time.

■ **St. Louis, IFR clearance**, scheduled traffic, United Air Lines, passenger flight, Apr. 15, DC-3 transport, 1 crew and 5 passengers, hit into ridge of roadside barrier, but among them (CAA).

Weather reported to pilot on route was reported up and made more complex.

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■ **St. Louis, IFR clearance**, failed in fuel approach, scheduled traffic, United Air Lines, passenger flight, Apr. 15, DC-3 transport, 1 crew and 5 passengers, rolling into ridge of roadside barrier, but among them (CAA).

most new loss profile DME, and CAA, changed cockpit area, schedules to differentiate VAR from VAR of cockpit.

■ **Ontario, Calif.**, flew into ground, scheduled and cargo line, Los Angeles Airways, narrow light but with pilot equipment training in mind, July 2, 551 carrier 2 crew, minor control time for maintenance cause (pilot training CAA report).

■ **Ontario, Calif.**, IFR clearance, but scheduled traffic, United Air Lines, passenger flight, Aug. 26, DC-3 transport, 1 crew and 44 passengers, on approach road approach into uncharted land (CAA).

United looked pilot again on necessary time to shorten instrument procedure.

■ **Ontario, Calif.**, flew into ground, scheduled and cargo line, Los Angeles Airways, narrow light, Aug. 27, 551 carrier 2 crew, minor control time for maintenance cause (pilot training CAA report).

■ **San Francisco**, crashed into hill, scheduled traffic, United Air Lines, narrow light, Sept. 12, B-77 transport, 1 crew, and crashed for unknown cause, failed during takeoff approach (CAA).

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Robert Hensley has opened a drive to improve standard maintenance and production procedures.

He started the standard safety checklist data with an "input." New Year's Eve telegram to all CAA regional administrators. This ordered them to get all available cooperation on an all-out standard C-46 operations and maintenance inspection and to report for their full data. This is to be followed by a concerted follow-up data on all standard operations.

At the end of the three days, regional reports received showed that from a total of 257 individual plane inspections, four "violations" of safety regulations were found along with 155 so-called "discrepancies," meaning in perfect condition of a generally, minor nature. These figures are not complete, however, as the Texas region reported "discrepancies" without a count and the California region reported "processing violations" without discussing them.

► **No Overloading**—There was no passenger guarding action reported, no desertion of service status, especially

new flight prospects, at all costs, failed.

However, it appears that most of the three days, C-46 status in 1951 is attributable to good luck.

Engine trouble for burning through the wing was the apparent cause of the Hensley crash. Flying below maximum altitude, a bad weather up-draw caused the Little Valley crash, and CAA investigation at the cause of the firebombs, Alaska crash appears to have resulted from loss of radio and radio contact during instrument approach among the aircraft.

► **Little Valley Crash**—An in-flight instrument crash analysis of the Little Valley crash indicates the following probable cause, confirmed by official investigation with CAA investigators.

Flight originated in Miami. It stopped at Pittsburgh and ended on a crash and since passengers from their board for Buffalo to start a new flight back to Miami. For some, time was obtainable between Pittsburgh and Buffalo was supposed to be 1,000 ft.

The pilot filed a flight plan to fly via, but weather conditions changed down, with landing under 4,000 ft, and

wing conditions reported from 4,000 to 13,000 ft.

So he apparently decided to fly low caused of burning back—probably because he cannot not only passengers but the flight crew scheduled to fly a Buffalo-Miami flight. Trying to fly steadily when clouds were down to the hills had the same fatal results as in the Santa Barbara crash of a United DC-5 and Oakland crash of a United DC-5 also during 1951.

On the scene, it is first apparent that one engine might have been down, because its prop blades were bent backward, but the other engine prop were bent forward on impact to prop development power levels known in the two engine aircraft with the ground.

► **No Mechanical Failure**—Inspection of the prop pins and engine indicated both engines were developing power and that one engine was probably killed by contact with the terrain several hundred feet before contact with the ground.

No investigation now believe that was neither weather nor navigation error, not a mechanical failure.

Boeing Shuffle

► **W. E. Beall** becomes top operating executive.

► **Closer direction** between Seattle, Wichita operations.

A reorganization of top management last week set up Wilfred E. Beall as senior vice president and principal operating executive of the Boeing Airplane Co., immediately to President William M. Allen and the Boeing Board of Directors.

The move came shortly after the company had announced that it had begun to solicit orders for its \$1.75 billion, one of the largest in the industry.

Beall will have general supervision of engineering, manufacturing, cost control, administration, and other functions at Seattle and Wichita. He has long been a key man in the Boeing organization as vice president, engineering and sales.

► **Big Reorganization**—Boeing President Allen said that the new Boeing management and overhaul of Boeing operations announced simultaneously were designed to bring about "greater possible uniformity of policies and procedures" between Seattle and Wichita divisions. He announced that all functional department heads at Seattle as a part of this new program, would assume physical direction of similar functions at Wichita, if they had not already done so.

The new general consolidation of responsibility at Seattle was preceded last year by consolidation of the Seattle and Wichita engineering departments under E. C. Wells, vice president, engineering.

Other functional heads at Seattle who are assuming physical direction at Wichita in week include P. F. Lindner, vice president, manufacturing; J. D. Young, vice president, controller; A. F. Logan, vice president, industrial relations; H. E. Rossmore, secretary-treasurer; George Sorenson, director of operations; R. P. Kistner, quality control manager; and Russell Mandelk, director of public relations and advertising.

Fredrick B. Collier, vice president, sales, and Roy Morrison, in charge of industrial products division, do not have corresponding departments at Wichita.

► **Report to Beall**—Earl Schaefer, vice president, general manager of the Wichita division, will report to Beall hereafter, as will the officer of Boeing Washington and Dayton departments.



Wilfred E. Beall

Other changes in the Boeing organization at Wichita include a second vice president, manufacturing, Wichita, in addition to his former post of vice president, operations, Seattle.

A. W. Schapp, Wichita factory manager, continues in that post, reporting to Collier.

Carl Riecke has been named vice president, divisional controller, Wichita, and assistant secretary and assistant treasurer for the company. He formerly was vice president, assistant general manager, Wichita. He will be responsible for finance and contract administration at Wichita.

Clyde Shaw, former assistant secretary-treasurer, Wichita, is transferred to assist in vice president controller, Seattle.

► **B-47 Modernized**—Jack Clark, former assistant to factory manager, Wichita, is named manufacturing captain supervisor in charge of B-47 modernization, is transferred to Grand Central Aircraft Corp., Tucson, Ariz.

► **B-47 Shortage**—A presentation from a military chief engineer to chief engineer, Wichita, is expected to be 425 of Boeing's production is assigned to subcontracting.

Net earnings at the end of the third quarter were reported at \$4,155,184, compared to \$2,123,252 for the last three quarters of 1950. Reductions were attributed to lower profit on government business, higher revenue and cost profit losses, and to changing the largest airplane contract to a type which does not show income until the airplanes are delivered.

Employment at Seattle has risen to 38,000 and at Wichita to 25,000, as compared to pre-Roosevelt figures of 34,800 and less than 10,000, respectively. World War II paid Boeing employment was 71,000.

Expansion program at Seattle include a new engineering and office building, flight test hangar and testing construction building, all paid for by the company, and government-financed construction of a national housing and warehouse building and a housing shop and more new machine tools.

Seven major construction projects at Wichita include a new flight test hangar big enough to house 12 B-47 bombers, a new electronic building, retrained power and training, and four new buildings.

Recent programs include quantity production of B-47 night bombers, Boeing KC-97 Stratofreighters transport planes, TB-50 Superfortresses bomber transport, guided missile development, and production of a small gas turbine for the Navy; production and sales of electronic testing equipment, an anti-aircraft tracking, and power line suspension clamps.

New Copter Blade De-Icers Announced

New electric driving for lightweight rotor blades, using a system similar to the device found sometimes used on aircraft propellers, has been developed and tested by Bell Aircraft Corp. under New contract.

Barthelme Keller, Bell chief helicopter engineer, said the system can remove 50 de-icing tests in 30 days at the moment of Mt. Washington, N. H., with analysis system. The system uses a neoprene rubber strip with electric heating wires embedded in the strips. These are stretched along the entire length of the main rotor blades and cover about one-third of the blade.

Tests were in temperatures ranging from 50° to -14° in winds up to 33 mph and in freezing mist and snowstorms. The development equipment was supplied by B. F. Goodrich Co., Akron. It was installed on the 15 ft C-47 de-icing system of a Bell Navy B-17. Copter was flown in the tests at Mt. Washington by Richard E. Byrnes, Bell test pilot. He reported the de-icers caused no adverse effects on normal operating characteristics.

Earlier Sikorsky helicopter blade de-icing experiments in 1950 involved hot air circulating through ducts passing wires, electric or heat energy to motor.

► **De-icers Made**—The engineering of the wing problem of helicopter blades will overcome one of the most serious handicaps to all further export. A Navy spokesman and the Mt. Washington tests developed sufficient data include possible use of similar equipment on rotors of virtually any size and type now contemplated.



AF Takes Wraps Off Boeing XB-52

Also is the first official photograph released by the Defense Dept. of the big eight-engine Stratofortress heavy bomber. Release was consistent with taking of the plane's unveiling to permit engine tests.

In keeping with Air Force Secretary Thomas K. Whitaker's report that no information beyond that received by the Department of Defense be passed on during the test phase, Air Force Week headquarters prints in full the official test accompanying the first XB-52 photo.

"This photograph of the Boeing XB-52, the Air Force's eight-engine heavy bomber, was made public by the Air Force today as major outposts of the aircraft at Boeing Field, Seattle, Wash., reported moving the aircraft to a more exposed area as well as removal of camouflage. The XB-52 has been visible

occasionally, since it was rolled out from the Boeing factory on Nov. 29.

In showing the photograph, Air Force Secretary Thomas K. Whitaker noted the following statement: The Air Force is releasing a photograph of the Boeing XB-52 which shows the first public appearance of an aircraft that would be of value to an enemy. We are making the photograph available only inasmuch as the engine run-up tests require that the aircraft be more exposed.

"To protect the security of other information concerning the bomber, it is requested that news photographers and the public cooperate with the Air Force by refraining from taking any other photographs. We will make every effort to continue to protect the planned security of this aircraft. The cooperation of the news media under the cir-

cumstances of this test is appreciated in this connection. We need not be too cautious to protect such understanding and cooperation in the interest of making the airplane by a potential enemy of information about the classified projects as difficult as possible."

"The Boeing XB-52 has been previously announced as a four-engine jet bomber equipped with eight 15,750-hp engines made by Pratt & Whitney. No further details on the aircraft are being disclosed."

Since the above release, there are additional XB-52 facts have disclosed by the USAF. The big bomber weighs over 100,000 lb., with operational cost approximately \$250 per pound. The total requirements for the XB-52 are about 200 kg., or enough for 380 average American horses.

Management Key to Martin Money

Sweeping financial plan involves RFG aid and higher 4-6-4 price; but it all depends on change in top officials.

By Alexander McHenry

South for new top management for the Glenn L. Martin Co. was going on last week inside and outside the aircraft industry as the necessary prerequisite to getting into effect the new \$12-million financing program for the Baltimore aircraft company. It was anticipated that new management was a condition of that new financing plan.

With capable aircraft management talent already spread very thin by expanding military programs, some industry sources feared that the new top man might well be picked from an allied industry, such as a transportation equipment manufacturer.

If this is actually accomplished, it could mean that C. C. Posen, current president, would continue with the company for a transitional period, or until the new management was ready to act, by moving in its own train. There was other speculation that Posen might stay on at Martin as production boss, but with a new management to creative handling the financial aspects. Posen is recognized as a top production genius in the aviation industry.

► **Financing Plans.** Details of the Martin financing program, disclosed by Navy Secretary Dan Kanball, indicate that as much as \$12 million additional in aggregate financing is scheduled. This is subject to Martin stockholders' consent.

Kanball's announcement and the new plan had the full endorsement of Air Force Secretary Theon K. Foster. Analysis of the financing program shows that it is divided into two significant affecting Martin's immediate and medium-range concerns.

► **4-6-4 Arrangements.** Modification (spread) of prices on the 48 4-6-4 aircraft ordered by Eastern Air Lines and the 40 ordered by TWA and on options to additional 4-6-4s is a part of the agreement, Kanball said. The modification provides an increase of approximately \$25,000 per plane in the price to be paid by the airlines.

Original price was reported to be approximately \$475,000 per plane. The increase would mean an additional total percent of over 10 to 15 million by the two airlines. Martin Kanball said that the two airlines had agreed to this. And Kanball said that the two airlines had cooperated in the general financing plan.

► **2-6-2A Funds.** Release by RFG of its claim to net proceeds from the sale of Martin 2-6-2A transports which have

been estimated at \$45 million is paid into the plan. RFG had had a claim on the 2-6-2A sale proceeds in additional collateral on its loan of \$44.5 million to Martin, secured primarily by a first mortgage on the Martin plant and facilities. These other assets are currently appraised at a value of up to \$55 million and are being expanded through 500 million additional of facility costs.

They are considered ample security for the loan, without the additional 2-6-2A collateral. The 2-6-2As are still under lease to TWA, pending a placement by 4-6-4s, and are to be turned back to Martin as ordered, for sale to other operators. The 34.5 million advance for these proceeds is a tentative figure and final sale price could be more or less.

► **Losses Recovered.** Request simple contribution to the plan, Martin financiers in the plan is an increase in Martin to finance defense contracts from the current \$16.5 million to \$27.5 million, a step of \$11 million. This is considered ample, Kanball said, to finance the general defense contract backlog reported "in excess of \$400 million."

Banks which have handled Martin's earlier loans are Mellon National Bank and Trust Co., Pittsburgh; Citicorp National Bank, New York; and the Baltimore National Bank. It is probable these banks will handle the new loans as well.

► **Defense Costs.** Establishment of a \$7.5-million credit reserve for Martin is programmed under Section 301 of

the Defense Production Act of 1950, with RFG providing the credit. The action authorizes such credit to companies participating in defense programs when it is not available otherwise.

► **Private Financing.** New private capital provided by an arrangement through South Bureau & Co., of New York, is expected to provide the balance of the \$12 million new financing, which figures out to approximately \$6.5 million. Earlier it had been reported that the South Bureau share of the financing would be \$5 million.

Useful reports are that the financing group will include Lawrence S. Rockefeller, who already has substantial aviation interests in Eastern Air Lines, McDonnell Aircraft Corp., Puerta (Heliport) Corp. and Republic Airlines. There was some speculation that at least part of the new Martin loan agreement might be drawn from one of these other aviation companies.

Glenn L. Martin, founder and chairman of the board of the Martin company, and South Bureau are expected to be principal figures, along with the military services, in guiding the new management personnel. But it is understood that the new management will have to be acceptable to RFG and Office of Defense Mobilization as well as to the military services.

There were reports that Mr. Martin, who owns 26.6% of the currently out-standing stock of the company, would take less active voice in the management under the new setup than he now. It is assumed that the new private financing will be handled through one of additional company stock.

► **Loss \$18 Million.** Martin financial difficulties are attributable largely to losses suffered in its controversial joint post production program with the Navy in its first postwar transport, the Martin 2-6-2, as well as its current production program on the recent 4-6-4.

It was previously reported (Aviation Week Jan. 10, p. 14) that Martin losses amounted to \$18 million for the first nine months. A spokesman for the company attributes this largely to unusual costs of money and materials and increasing production costs following the Korean crisis, which were not taken into account when the original price of the airplanes was set.

Martin's current military backlog includes orders for the USAF B-72, Canberra light bomber, guided missiles and the Martin, Viking and others. Navy flying boat and patrol bomber contracts, large subcontracts for production of components of C-119, are yet to be let, and considerable electronic business.

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Developed by Gilfillan for the USAF, the latest GCA radar landing system is now being produced for the U.S. Navy, the U.S. Marine Corps, the U.S. Air Force and for use by other

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AERONAUTICAL ENGINEERING



Fiat Discloses Details of Turbojet G 80

- First Italian turboprop aircraft starts flight tests with de Havilland Goblin 35 centrifugal engine.
- Succeeding prototypes of the trainer-fighter will carry Rolls-Royce Nene and DH Ghost powerplants.

Flight tests have begun for Italy's first turboprop aircraft, the Fiat G 80 trainer-fighter. Almost 18 months after first announcement (Aeronautics World, July 31, 1958, p. 25), the plane flew at Turin in southern Italy only in December. Vittorio Corbelli, Fiat pilot, was at the controls for the first flight.

The first version of the G 80 is powered by a British de Havilland Goblin 35 centrifugal turboprop; it will be followed by a second prototype with a Rolls-Royce Nene. And there will be a third using the de Havilland Ghost engine.

The design of the G 80, which marks a renaissance in Italy's highly competitive aircraft industry, is the work of Prof. Corbelli of Fiat. And the development of the aircraft must have been quite a task for the Italian, located in Italy, they were by lack of research facilities.

► **Similarity**—Perhaps the best U. S. plane to use as a comparison for the G 80 is Lockheed's P 50 Shooting Star.

The airplanes are similar in performance, dimensions and weight, but not in appearance.

Discreetly, the G 80 stacks up this way: Span, 35 ft.; length, 40 ft. 6 in.; wing area, 279 sq. ft. Its empty

weight is 5,950 lb., and gross is 11,910 lb.

Maximum speed of the trainer is 350 mph at sea level. With flaps, it stalls at 125 mph on the deck. Climb is 94,000 ft., and the stall speed is 2,100 ft.

As part of the Fiat plan for getting maximum performance out of the tank, wing profile and wing-area tolerances of 1 mm. and 0.2 mm. respectively were set. The actual wing air suction showed contour variations under 0.05 mm., and roughness under 0.1 mm.

The wing is skinned with thick sheet, heat-treated. Skin is fastened with an internal bolt type fastened with countersunk rivets.

► **Stiffness**—Aerodynamic phenomena are accounted for on the G 80 design by mating wing and tail surfaces very stiff in torsion. Rapid transmission of force flexible cable wherever possible in the plane.

Adverse and redox are so thin that internal installation of balance weights was not possible. Consequently, weights were located near those surfaces and connected to the surface through a system of levers.

High strength alloys of an unexpected type were used in the construction of the G 80. New shop and inspection

techniques had to be used at Fiat to handle these materials. Checking of the finished parts included inspection with fluorescence in black light, similar to the Zeigle process.

► **Structure**—The monocoque fuselage of the craft is divided into three sections. The nose part includes the cockpit, the main wheel and gear and the engine air intakes. The mid section is the structural heart and is as in the wing center section, in addition to carrying the main fuel tanks and bearing the engine. The tail section contains engine tailpipe and, of course, bolts on the tail surfaces.

The nose section is held on with a Fiat-developed worm fastener which permits quick removal. It can be replaced with other noses equipped for different uses.

The forward position is for the 10-man cockpit, and the rear one for the student. Both positions are fully instrumented for day and night flying. Canopies are gasketed and seals are Morin-Breton type. The cockpit is instrumented and sealed with an airtight tubular joint.

The wing panels are center and two outer—on a conventional box construction. Metal-covered aluminum and light flaps are fitted. The panel can be replaced with sections of increased span to boost wing area and aspect ratio.

► **Exhaust**—Six metal tanks near the fuel supply tank are in the fuselage and two on each side in the outer panels. Nylon-rubber tanks also have been designed for increased fuel capacity.

ity. And weight tanks can be fitted. Whetzel equipment is all die-cast, supplied by dynamos and two series-wired alternators. Two external plug connections are provided, one for lighting national emblems and the other for starting the jet engine.

Radios in a VHF transmitter-receiver with 10 channels.

Line communication is a Geminet-type, wing section transceiver. It is operated from either cockpit or is an intercom variety.

During the flight test period, the jet cockpit contains a photometer to evaluate. In addition a recording device registers pilot's comments.

BEA Outlines Specs For Passenger Copter

A 45-passenger helicopter is the latest answer to the short-haul problem of British European Airways Corp. That is the implication of the report made last week by BEA in a type specification now ready for circulation throughout the British aircraft industry.

The spec outlines the design of a multi-engine copter which should be capable of economic operation over stage lengths of 75 to 250 miles, between city centers.

BEA's conclusions were reached after

five years of experience with its experimental helicopter used, and as a result of engineering, economic and traffic studies. Internal studies within the British Isles and across continental Europe, visits were considered in the studies.

Such a large helicopter would probably be developed first as a 30-passenger job to fly a distance of 115 miles with full fuel and one hour reserve. But the machine should be designed with reserve capacity to take 45 passengers and fuel for a 250-mile flight at some later time.

With a couple of this size, BEA says its preliminary estimates indicate competitive costs (especially with fuel-burning planes) as a realistic basis.

In addition to the number of passengers, stage lengths and multi-engine requirements, BEA also says it would like to have:

- Cruising at 150 mph or better
- One-engine-out performance.
- Easy handling even in the worst weather.

• Deicing and anti-icing comparable to contemporary fixed-wing craft.

• Landing field of 400-ft diameter with surrounding obstruction slope of one in two.

After design studies have been made, BEA hopes to order a number of prototype craft of different designs for evaluation.

Nylon Bearings Show Long Life

Experimental proving at nylon bearing blocks for engine applications has shown promising characteristics. Subbiah of DLR, Hildesheim, has been following these tests down to the last on a lead-in to the nearest hundredth of a millimeter, and has reported very low production costs.

The nylon bearings are said to last 4 to 5 times longer than bronze bearings and require a percent of one inch per square centimeter, with almost no lubrication required.

The product is being sold under the trade name of D-Rings.

Laminating Resin Takes High Heat

A new high-strength, high-heat polymer laminating resin is under test at Wright Air Development Center for use in manufacture of fire planes and guided missiles.

Development of the material, reported to withstand temperatures as high as 100F, is United States Rubber Co.'s Neoplast Chemical division.

Laminating resin with the resin and glass fabric are said by the company to retain good flexural strength—45-47,000



UTICA HELPS



BY FORGING EXTRA "FIGHT" INTO TURBINE BLADES

Here's the turbine assembly of Pratt & Whitney Aircraft's great J-42 Turbo-Wasp—first jet engine to attain official rating for 1,000-hour overhaul.

Take a particular look at the turbine blades, photographed after 500 hours of actual operation. Besides contributing to the general service dependability of the J-42, they have another remarkable story all their own.

Combat pilots in Korea report that these blades, oper-

ating at 11,000 rpm and at extremely high temperatures, have taken damage from bullets and rocks without serious impairment of engine performance—and brought plane and pilot safely back to base.

The forging of rugged blades like these is the type of work we're doing here at Utica. We're proud that Utica was one of the earliest primary suppliers of turbine blades to Pratt & Whitney Aircraft for the Turbo-Wasp.



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He and his son both fly... use their Cessna 170 constantly for personal contact with distant properties, separating and showing property from the air, taking aerial color photos of choice farms and for hunting and fishing trips. In the first year, Paul feels he paid for the 170 three or four times over—in cash he would not have needed without the plane.



F. J. MEYER, MADISON, WIS.
At 41, Mr. Meyer heads Red Dot Foods, Inc., a \$4,000,000 a year snack chip and potato french business which he started with one potato chip machine while still in college.

Mr. Meyer purchased his first Cessna in 1948 with the express purpose of speeding up business operations—now owns a Cessna 170. He flies between sales branches and plants in six states and potato farms in Wisconsin, Arkansas and Florida—attends many conventions and packaging shows—enjoys his plane as the aircraft from a beach house in Madison, Wisconsin. Last winter he flew to Hawaii. Mr. Meyer says that without his 170 all of these things could not have been accomplished.

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Improved performance at a price far lower than any other 4-place, all-metal airplane. Refined control system for finger-tip handling and ease in all flight attitudes. Brilliant new custom finished interior, matched with dashing lightlined exterior in colorful trim.



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Take your Cessna Dealer today for a demonstration of the added advantages built into the new Cessna 170. Or write Cessna Aircraft Company for your business brochure for full information on the new Cessna 170 and the Cessna 170 Series, CESSNA AIRCRAFT CO., Dept. H, Wichita, Kansas.

20—when exposed for as long as 1200 hr at 300V, and over 10,000 psi, when exposed for as long as 24 hr at 500V. Most resistance is attributed to minor portion of tracheal system.

Selected as WMAA S-1947, the team actually will be available for military applications, the company reports, but production capacity is being expanded to take care of electrical, electronic, radio and allied applications.

**Busy Year Forecast
At Wright Air Center**

Dayton—The year 1952 promises even more activity than last year 1951 brought the 10,000-odd employees in the Wright Air Development Center here.

Engineers, scientists, pilots and specialized laboratory technicians have on tap about 1,300 individual projects, releasing advances in virtually every phase of developing a complete Air Force.

A rough grouping of categories would include: subsonic, supersonic, propeller, guided missiles and electronics in addition to supporting programs. Highlights of each include:

• **Airframe.** Tested for flight tests is the Cessna 170, a revamped version of the 145. Further information on aerodynamic is anticipated from extensive tests of the X-5 and the XF-105 featuring, respectively, the variable sweepback wing and the delta wing configurations.

• **Engine.** NEPA ("Nuclear Energy for the Propulsion of Aircraft") is the big word in this field. It could revolutionize current thinking on plane power plants. Air Force has signed a development contract with Consolidated. When the study and design of an aircraft to be powered by NEPA, jet helicopters are scheduled for testing as a result of engine performance in Korea fighting.

• **Propellers.** Research studies go on the fastest for propellers capable of supersonic speeds. This amounts to a resurrection for propellers, which were considered the "obsolescent" scrap pile at the onset of jet propulsion. New tests test up propellers for considerable more work, to the helicopter phase of this activity.

• **Guided Missile.** After one brief publicity splash on the Martin Marietta, Air Force put the program under wraps. Data obtained by WADC have given ground tests now result in closer approximation to "junk better" of test.

• **Electronics.** This is the most active of all of the major fields. Virtually every electronic device is being improved and new ones are being added. The goal in this activity is light in all



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possible weather conditions, as well as overall improvement of operational efficiency and safety.

In-flight refueling will be given much attention, following repeated tests which revealed the value of this contribution to long range operations. Data already compiled in connection with the B-47 (being refueled from KC-97) indicates techniques can be adapted to any type of aircraft.

Considerable stress also will be placed on cargo parachute dropping techniques. Also a perfection of equipment to a point where complete automation can be supplied by air with electronic control of dropping 10-ton equipment without spiking it all over the land scape.

Consequently, there is a rather busy WAADC activities may be listed a bit closer to the parent organization, Air Research and Development Command, by moving the latter to Wright Patterson AFB near Dayton. The present arrangement has been a source of expensive errors to Air Force contractors who need to do business with WAADC project engineers at Dayton and ARDC buyers at Dayton.

Seven agencies presently comprise WAADC operations. All laboratories, they are Weapons Systems, Weapons Components, Aerodynamics, Research, Flight Test, Material and Engineering Studies.



Circle Cutter Fits on Bandsaw

A cutting attachment for hand saws doing dry cuts at Texas Engineering and Manufacturing Co. Inc.

Use of the device has effected an average reduction of about 90% in machines needed to produce disks and other wood items having one or more curved dimensions. As easy as 1-2-3



Lockheed's new Super Constellation features improved cockpit vision with Pittsburgh Flexseal Safety Glass

Newest addition to Lockheed's famous family of Constellations is this giant 304R Super Constellation. Pilot vision came in for careful attention in designing this plane, and every possible step was taken to assure the best visibility in all directions under every flying condition.

The seven openings in the cockpit are all glazed with that Pittsburgh Flexseal Safety Glass. This glass and plastic lamination has been found ideal for the high-speed, high-altitude operation typical of the Constellations. It is fast-mounted with suction pins that provide the best possible obstruction to vision and it is bird-proof.

The three forward glass areas in the cockpit make use of chemically-treated Pittsburgh NERA Glass. This special type of Flexseal was installed after exhaustive tests of its bearing and preventing cycles at Lockheed Laboratories.

Thus the 88-passenger Super Constellation takes its place alongside many other commercial and military planes equipped with Safety Glass by Pittsburgh Manufacturers continuously being their glazing problems in Pittsburgh, knowing they'll receive competent engineering assistance along with Safety Glass specifically designed for the job it must perform.

We invite you to submit your Safety Glass and glazing problems to Pittsburgh engineers; they'll receive the most careful attention. Pittsburgh Plate Glass Company, Room 3035-2, Genesee Building, Pittsburgh 19, Pa.

Right view of the Lockheed 304R Super Constellation, the newest member of the famous family of Constellations that are in service on 16 major world airlines. All glass in the cockpit is Pittsburgh Flexseal Safety Glass.



A close-up view of the side windows of the Super Constellation cockpit. Note the unobstructed vision insured by an advanced glazing method that permits the use of extremely narrow panes.



These three forward glass areas are chemically-treated NERA Glass to insure the best vision under every flying condition.



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IN THE NEWS

SERVICE

Getting top attention from jet engines requires many techniques. Here are a few of the means used by General Electric to help the Air Force get maximum use from its J47 engines.

To provide immediate service for General Electric engines, more than 30 G-E Service Shops are placed strategically around the country. Four of these shops are currently handling aircraft gas turbine work, some can be adapted as required. Skilled technicians provide rapid and complete repair and overhaul facilities.



At an Air Force base, a G-E representative shows Air Force personnel some fine points of jet engine servicing. To back up this field training, formal G-E jet engine schools have been functioning since 1942. Courses are now presented in fundamentals, overhaul, flight test engineering, and live maintenance.



G-E service follows G-E equipment around the globe. Here, "tech reps" from General Electric and North American Aviation Inc. in Korea discuss combat performance of the G-E-powered, North American-built F-86 Sabre. G-E engine field service representatives cover the vital spots in the world, are always available.

For quality products and dependable service, call on the company that pioneered the aircraft gas turbine industry. Telephone your General Electric aviation specialist or write General Electric Company, Schenectady 5, New York.

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AND THERMOELECTRIC THERMOMETERS

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1	1"	1110	10101
2	2"	1110	10102
3	2"	1110	10103
4	2"	1010	10104
5	2"	1010	10105
6	2"	1010	10106
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98	2"	1010	10198
99	2"	1010	10199
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No. 442A, Six Pole, Double-throw Instrument Switch in 2 1/2" round case, one hole mounting, 5-32 threaded housing

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1 1/2" 102



2" 2181C



2 1/2" 442A

different items of these types are required such as: for use in cover plates, slugging-cable cradles, etc. These cradles are made of two or three sections are required to set up the device—on auxiliary table 14 in. square by 15 in. thick, placed on top of the hand-on table and fastened by two thumb screws.

A movable table pin serves as a pivot for revolving the wood on which the cradle is to be cut. Two scales at right angles to each other serve to locate the radius pin against which the wood is pivoted.

Camera Will Record Dive-Bombing Runs

Precision data from dive-bombing runs can be gathered by what is probably the largest 16 mm. camera yet built—the 1,500-lb. Beckman & Whitby Target Angle Recorder.

The unit was ordered by U. S. Naval Ordnance for studies of aircraft flight paths and dive-angle variations. It takes 16 photos per second for a period of two minutes.

Ground take on top of the assembly is used for aiming the entire unit.

The operator of the camera aims a control stick like that of an airplane to keep the craft centered in the cross hairs of the sight.

Later data call for low bombing runs to be made on the recorder. Remote lighting of the recorder will be done by radio with the camera mounted behind the gunner. The control unit will be placed at the tracking station for the television signal from the camera sight.

Frames are photographed through a large globe which is marked with radials and azimuth numbers. The internal components of the camera is mounted at 90° by isolators and vibration-dampers for dimensional stability of the picture.

Camera is made by Beckman & Whitby, Inc., 946 Six Carlos Ave. San Carlos, Calif.

'Water Table' to Check Sonic Data

A "water table" by studying shock wave patterns beyond the sonic barrier, such as those set up by supersonic jets and guided missiles, has been constructed for the ongoing development of the University of Tennessee.

Considered a supplement to wind-tunnels, the model will be used for studying future engines the principles of supersonic flow. It is capable of producing data on effects of speed as high as 1,500 mph.

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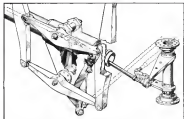


VALVE DIVISION

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DOUBLE STICK controls (contact point upper left and center) have been tested in large SE-2040 Annapolis transport in a series of relieving pilot fatigue.

French Fly Jets From 'Armchair'

Unusual control systems in the Grogard is claimed to reduce pilot fatigue and eliminate cockpit clutter.

(McGraw-Hill World News)

Paris—A young French aviator says that his latest armchair flying out of the cockpit and installed in the front office of a high-powered jet fighter. He did it with an unusual system of controls that replaces the conventional stick or wheel.

The invention of Jacques Lecaune, engineer and test pilot in SNCASE (Société Nationale de Construction Aéronautique de Sud Est), the system is being in the SE-2010 Grogard, a turn jet fighter prototype.

System Design—Lecaune's armchair is mechanically simple. At the top of each arm there is a handle which the pilot grips. Conventional rods provide control in three and behind (or slow) the transfer the movement of his arms into flight direction.

The pilot's arm motions are about the same as in conventional controls. To gain altitude he pulls back because only on the handles. To reduce altitude he pushes forward. To bank he pushes down vertically on the arm in the direction of the bank and moves the arm on the other side.

The mechanism of the two arms are interconnected so that a vertical push on one arm also moves the other to produce a bank. A horizontal thrust on one arm is duplicated in the other arm for a change in altitude.

The armchair is adjustable to fit the pilot. And Lecaune has drafted an adaptation of this system for planes in



ARMCHAIR FLYING by manipulating close handles is another fatigue-easing system.

which the pilot is in a prone position. Advantages—Lecaune and SNCASE claim three major advantages for the armchair control system. Close view of the instrument panel, a result of elimination of the control bar stick, as wheel modification. Fatigue reduction, resulting from the simplified movement and seat. Close control, since from the elements of the electronic control system. This should make escape from the cockpit easier.

Double Stick—Lecaune began working to improve aircraft controls before the end of the war and applied for his first patent in a new type control Sept. 11, 1945. In addition to the armchair controls in the SE-2010 Grogard, he has built a "double stick" control system which has been tested with one factory modification in the big SE-2010 key engine Annapolis transport.

His double stick controls consist of a pair of sticks each raised slightly to avoid the center and placed one on each side of the pilot's seat. The system functions in much the same way as a conventional system. The mechanism is pivoted at its base so that changes in altitude are produced by moving the stick forward or to the rear and banks by a circular motion like the turning of a wheel.

This system also gives the pilot a clear view of his instrument panel at all times, but it has fewer advantages over conventional controls than the armchair in reducing pilot fatigue and in easing the cockpit of the maintenance of the stick.

Leakage—SNCASE flight tests conducted by Lecaune and others, while proving that both the armchair and the double stick controls have distinct advantages over conventional systems, have indicated there still may be room for improvement. Tests showed the armchair controls, tried out in the Grogard fighter, may be better suited for transport planes or bombers than for fighters. In the complexity required of fighters, pilots tend to react more naturally and quickly with a wheel than with the armchair controls.

Lecaune believes the best possible controls for modern planes should be designed to leave the cockpit clear of the maintenance of a conventional stick, should be easily operated by one hand, and should move in a pattern closely similar to that of conventional controls. He is working toward that goal, convinced that the type of controls now in general use are in fact some important modifications in the near future.

GE Sees Jump in '52 Electronic Work

General Electric's 1952 production of aircraft electronic test and control equipment is expected to total more than double the 1951 figure, and will exceed last year's total of the Electronic Division's business.

Dr. W. R. G. Baker, vice president and general manager of the division and in his previous statement that new plants will add in 1953 to the military production facilities which were completed last year, conventional test and radio manufacturing space.

And Dr. Baker has a word of praise for GE's large number of airports and subsidiaries whose cooperation made the expansion possible.

About 35 or 40% of the company's electronic test production is slated for the military in 1952. Work will be continued on high-reliability test and order applications. And Dr. Baker predicts an all-time sales and production record for electronics in 1952.

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PLenty of Boeing B-47 jet bombers are being produced at its Wichita plant, but...



THO 70% deliveries have been made to Air Force to permit combat training of crews.

Stratojet Delays Worry Air Force

Delay in delivery of Boeing B-47 nuclear jet bombers is beginning to worry the Air Force, which has been forced to restrict its training activities to transition.

There has been no combat training because Air has received an insufficient quantity of B-47s.

Plenty of the sleek, supersonic bombers are being produced, but serious problems involved and the shortage of technicians have delayed delivery of completed units to the Air Force.

■ **Biggest Problem**—The B-47 is designed to do the job in today's nuclear warfare that the B-29 did in World War II, but with a crew of four instead of 13 and at one-third the time.

Aircraft have had to be developed to replace jet crewmen. That has been the biggest problem. Boeing engineers report that 25 miles of wiring have been recovered to fit the job.

■ **Other Problems**—And there have been a good many other problems. For instance, getting bomb bay open and closed at 190 mph plus. That problem was serious, only to find to another—how to keep the "slingshot" from being torn out when bomb bay doors were opened.

Delays in engine and component parts delivery also have been reported. Shortages of both skilled and unskilled workers at Wichita, where nearly full-scale production is underway, have been serious. Now 1 Wichita had 111,490 personnel employed, out of a total population of 740,000. Aircraft and parts manufacturers now employ 37,150 and report five will need an additional 4,000-4,500 by February.

■ **Ray Report**—To speed up training of crews, USAF purchased the Wichita "Nuclear Jet" airport, adjacent to Boeing's B-47 plant, and established a jet bomber training base.

Training has been confined to transition-on wheels in F-33s, then three weeks in B-47s.

Combat training, when it comes, will require another six weeks. All pilots have 2,500 hr or more before they are assigned to the Wichita base.

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The Bendix Ignition Analyzer is available for either aircraft or portable engine installations. It can be used with either high or low tension magneto or battery systems. It is the ignition analyzer that can pinpoint spark plug failure before it occurs... make an efficient check of more than one spark plug at a time and do so in a large, easy to read screen... yet it costs less than comparable analyzers.

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Collins 17L VHF
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Not only that! Under the new Controlled Mode Rule Plan we are now authorized to use priority RQ-14 to get materials with which to fill orders from corporate plane owners for Collins 17L transmitters.

The businessman can now equip himself to operate in the same way under instrument conditions as the scheduled airline.

The Collins 17L transmitter provides twenty-eight facilities on all channels reserved for aircraft

communication in the VHF band—its frequency range is 118.0-126.7 megacycles, and all of the 140 channels assigned in this range are easily selectable over a single and positive rotary control system. The power output on voice is conservatively rated at eight watts. With this power, and the greatly increased number of frequencies now available, the pilot is assured that communication will be received and understood in the busiest air environments.

The 17L is a companion to the 51B navigation receiver with which many executive planes are already equipped. The pair provides reliable two-way radio telephone communication.

We will be glad to send you a more complete description of the 17L transmitter on request.



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Red Rockets

- Penemunde center is back in full operation.
- Russians are testing four missile types there now.

By David A. Anderson

Four rocket-propelled guided missiles, including the anti-aircraft weapon "Wasserkatze," are currently under test in the Rammstein at Penemunde, former center of German guided missile activities.

Besides Wasserkatze, the Reds are working with the A5, a second version of the V-2 rocket, the A5, half-scale V-2 used for control development, and an unidentified rocket of the V-2 type.

Penemunde itself has been heavily fortified and has a group of about 80 SAC-15 interceptors assigned for its defense. Launching ramps and new facilities have been added to replace and supplement those dismantled by German engineers before the Russians moved in at war's end.

• Besides Effort—just what has been going on behind that particular iron curtain has been kept secret during the past 61 years. But like the U.S. atomic bomb project during the war, the physical use of the establishment at Penemunde is just too big to hide or to conceal, effectively. Sooner or later, information is bound to leak out. And here is what is currently known about the Red rocket situation.

First, Russian development work seems to have started where that of the Germans left off. There clones of the Wasserkatze and the A5 would tend to confirm this belief because these two weapons were the last to undergo development during the Pacific campaign too.

So, any launching cranes have been built previously, for missiles of the V-1 or V-2 type. These policies are based on an assumed copy or from an elevated knowledge of it. They are some kind of vital need to get up to firing speed.

Two of these ramps are on the east end in the Penemunde North area and are near the shore of the Rammstein. In Penemunde West section. These can be located on the site of the Luftwaffe's ramps for its V-1 rocket work during the war.

• Wasserkatze—this anti-aircraft missile, still in a rocket-propelled anti-aircraft weapon. It weighed approximately 5,500 lb., was about 218 ft. overall length. Its rocket motor and other

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acid and sulfur, as propellants. Components and wings were fitted to the 3 ft dia. body. About 40 of these rockets were built and flown, about 25 flights were successful. Maximum speed was around Mach 5.

The A5 rocket was an attempt by the Germans to get more range from the intermediate V-2. It was made from a V-2 in which a set of eight wings had wings been added.

In theory, the rocket was to be launched like the V-2, go through burn-out to reach of trajectory and start the descent in the normal manner. However, at some point on the downward leg of the trajectory, the nose control system would feed in an angle of attack, program intended to pull it out of the dive and into a long glide. As it reached the end of this glide, it would be given another signal and dropped into the ground in a steep vertical descent.

Only three of these V-2 variants were built and fired.

Some of the Germans finally looked for a 500-mi. range, and some even considered the use of the A5 in the second stage of a two-stage rocket to bomb New York.

No serious engineering effort was even expended in that direction, due to previous published reports.

The A5 rocket was a test vehicle built to study control systems for the V-3 (which is more correctly called the A6). It was a half-scale model, which would make it about 23 ft long. And its powerplant was a so-called "cold" motor, which used the decomposition of concentrated hydrogen peroxide to furnish superheated steam as the exhaust gas.

Not much is known about the fourth reported weapon. It is an artillery rocket of the V-3 type. The design is reported to be "light blue" which does not indicate any of the standard projectile combinations.

Geography—Pernambuco, originally a tiny fishing village, is on the 14 angular island of Ilha de Itaipu, between the Bay of Santos and the Bahia Sea. It takes its name from the Portuguese, one of three branches of the Odebrecht family who built the Bahia and its north and east fronts on the Bahia.

Under the Germans, Pernambuco was divided into two areas, East and West. The former belonged to the Army, and was the seat of the German rocket program. Pernambuco East was subdivided into two sections, North and South. Pernambuco West was the Luftwaffe's, and incorporated one of its development centers as well as its workshop and buildings.

Pernambuco North was primarily a

Republic Thunderjet 7-042. The seven-foot long, eight-inch diameter of the 2.5 in. Air Force jet engine is housed in a single sheet of PLEXIGLAS. Courtesy: Republic Aircraft Corporation.



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Air freight traffic has increased 567% since 1946, continues to grow at a rapid clip. During this period, Lockheed engineers worked steadily on the problems created by this fast-growing business and have come up with much-needed developments.

Some of these developments were recently previewed by airline executives and industry officials in a 3 day seminar held at Burbank. It was revealed that Lockheed (1) has a new Super Constellation cargo plane designed to increase freight carrying capacity, and (2) has thoroughly analyzed the problems of loading, tying down, unloading and handling of freight at airports. One solution was Lockheed's mechanically operated nose model of "the ideal air cargo terminal," which has attracted national attention.

The new Super Constellation cargo plane is the most highly mechanized freight carrier yet developed, some of its outstanding advantages:

1. Solves major aircraft handling problems with three engine hoists—on all wheels (suspension). Rear is built on mechanical suspension, and a parallel, automatic cargo hoist of 10,000 pounds capacity.
2. Cargo "loads wings farther out faster" than any other airplane.
3. Increases carrying capacity, both in total load capacity and weight.
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The Super Constellation is the result of a decade of jet cargo research at Lockheed.

It combines the experience and dependability of the world's largest Constellation transport with greater size and greater operating economy.

It is 10 ft. longer than the standard Constellation.

It will carry 30,500 pounds, or nearly 25 tons, across the country.

It will carry over 20,000 pounds inventory from New York to Paris.

It has net usable space totaling 5,500 cubic feet, equal to nearly three standard refrigerator units.

And its metal wingless floor permits more than 1,000 lbs. per sq. ft. or 1400 lbs. per square ft., higher density cargo and a wider variety of cargo.

Many versions of this airplane already have been ordered in large numbers for both the Air Force and the Navy.

development area, and included rocket launching platforms. Such was the enthusiasm and construction of test vehicles, these buildings were located in the past four years which, the company said, had been almost completely destroyed by the Germans, and that for years covered the rest of the structure. And in the last German fell on weapons development activities at Peenemünde.

► **Expanded Airfield**—In addition to the Russian postwar weapons development, there has been considerable expansion of the German-built airfield at Peenemünde. West. It is now a three-runway field; the main east-west runway is intersected near its end by a pair of strips at about right angles. Hangars are located north of the main runway. Apparently the main runway has some sort of a radio-controlled approach system, because the western end sports a radar installation and the eastern end has an automatic system which is about 50 ft. high.

Earth excavations at the eastern side of the field, height of the excavations is about 5 ft. The MIG 15s standing in the excavations are usually camouflaged with red.

During the excavations, held last fall, the Reds had some 150 planes stationed at the base, several models most appear to be about 50.

Additional defense units include con-

tributions of 9-m. anti-aircraft pieces situated about 500 ft. apart along the southern coast. Red army units stationed in the area also have students of light anti-aircraft guns with no particular kind of position.

A unit of the Soviet Air Force (which is the East German Republic's navy) is stationed at the base of the Peenemünde. It is equipped with several trucks of about 210 hp displacement.

► **Engineering-Development**—at future plans for Russian missile development, it seems certain that the installation of Peenemünde and the use of the facility there make it important right now.

Recent observation from European sources says that the Russians are beginning to concentrate their missile development work at Kallangrad (formerly the German city of Koenigsberg 55 mi. NE of Berlin). When this transfer is completed, Peenemünde could continue to be an advanced facility, or a test firing range.

The transfer for that transition and the type of experimental work continued at Peenemünde can be a very important clue to Russian readiness with guided weapons.

Foreign Interest In Stall Indicators

British, French and Italian aircraft manufacturers are showing increasing interest in jet-stall indicators at



HUGE VULCANIZER FOR AIRCRAFT FUEL CELLS

These plants of vulcanizing equipment that large was recently built recently was moved into B. F. Goodrich plant in Akron. This vulcanizer, a 40-ton steel cylinder 25 ft. long and 12 ft. in diameter is shown

as it was pulled out of its cradle on its landing. A 14-ft. vulcanizing ring for the vulcanization had to be shipped separately. Equipment was manufactured by Strohman-Wells Corp., Franklin, Pa.

reading to Leonard M. Grosse, president of Safe Flight Instrument Corp., White Plains, N. Y.

Prototype installations for 16 different types of foreign aircraft already are being developed by the company. The manufacturers are:

• **Embraer**, Willem-Alexander, de Haveland, Fieser, Glaser, Hawker, Hawley, Page, A. V. Roe

• **Fiat**, Avio, Aeritalia, Dornier, Soc. Gen. Nazionale di Costruzioni Aeronautiche di Sesto San Giovanni (SNCASO)

• **Italy**—Macchi, Fiat

During a recent trip to Europe, Grosse inspected the big SNCASO 2010 transport, which has been fitted with the Safe Flight warning system and

reports him confident in its possibilities.

New Industrial Scholarships Open

National competition for 14 Stein Fellowships in the executive development program at Massachusetts Institute of Technology has just been announced. Nomination by the employer is a prerequisite; seven successful candidates must be given a year's leave.

Applications must be made at MIT by Feb. 21. Candidates must be between 30 and 35 years old, with five to ten years of experience. Fellows will be in residence

at the Institute from June, 1952 to June, 1953.

Qualities listed by the Institute as the basis for selection include managerial ability, intellectual capacity, sensitivity to the social and cultural implications of industry and potential for industrial leadership.

Ten annual scholarships have been established by Otis Drop Forge & Tool Corp., Utica, N. Y., to prepare rising stars for industrial careers.

The scholarships, awarded on a non-exclusive basis, provide for two years of residence, scholarship and training at the State University of New York's Department of Mechanical Technology—a part of the State Institute of Applied Arts and Sciences. Studies will be supplemented during the summer months by on-the-job training in manufacturing plants.

THRUST & DRAG

Capt. R. C. Babson suggested in *Cavalier* (November for Dec. 24, 1951), that oil dilution increases the chances of combustion. He said, and rightly, that oil dilution by gasoline changes the flash point of the oil. But there is another side to the story. Spontaneous ignition temperature is an important factor as far as the flash point, which in each the temperature at which vapor ignites spontaneously in the presence of a flame. Following oil by itself shows a spontaneous ignition temperature around 450°; gasoline is up near 1,000°. Some NACA tests showed that as an mixture of 200 parts (which would be comparable with the flow through the nozzle of an engine cool) and oil ignited at 1,050° and gasoline went to 1,350° before it flamed spontaneously. Actually, the proportion of gasoline added in oil dilution should not raise the spontaneous ignition temperature of the oil appreciably. What all this says, then, is that oil ignites spontaneously before gasoline, that oil dilution by gasoline raises the mixture temperature to a not appreciably higher flash point, and that in the presence of a flame all bets are off anyway.

One of the most useful of government publications is a new bibliography of national docking with gas turbines and jet propulsion, and compiled at the National Bureau of Standards. Books published from 1930 to 1950 are listed and passbooks from 1940 to 1950 are acknowledged. You can order this bibliography from the Government Printing Office, Washington 25, D. C., for 70 cents. Ask for NBS Circular 329. Bibliography of Books and Published Reports on Gas Turbine Jet Propulsion.

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SINCE 1899

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Warren, Ohio

and Rocket Power Plants, by Ernest F. Ford and Carl Halpern

Engineers were asked to help build practical high-school teachers in some final analysis on a plan being sponsored by the Engineering Council for Professional Development. The Council also urged engineering schools to build substantial improvements in their course of study in that what they are teaching does not become obsolete during the next five decades. Colleges were urged to concentrate more on the basic engineering sciences—math, physics, mechanics are examples—than on the capstone engineering specialties as one particular subject.

Benchmark for the state of Utah's increasing engine development. Bristol's engine drives school's test. Bristol 154 engine from packed parts of Viking powerplants. Some of the components had as high as 1,000 in. running time. The engine was then run through a complete cold type test which lasted 110 hr. The test was a success. And the stoppings-down parts were within the limits set for new engines about to go into service. Bristol is currently buying for a 1,200-hr. rating for the next year.

A small, separate window for research and instruction has been placed into operation at Massachusetts Institute of Technology, New York. Powerplant is a new engine, Packard V-1615 (Bristol-Rover, Merlin) engine, engine, which drives the tunnel up to Mach 1 through combustion of various and various gases. The tunnel was once electric, chemical and liquid fuels. The Institute's department of aeronautical engineering. Test section two is not specified but is presumably multi and two-dimensional. It would vary of course, with the test. No mention of solid. Soliders and aerodynamics are possible are available.

Saturday studied at the study of the J. F. Shop to take a distribution rate of 499G (Aviation Week, Nov. 26, 1951, p. 41) and make a letter asking if we may be allowed to check these "preparation" statements put out by the Air Force. Not being authorized, our data is checked, we backed the whole business to the Edwards AFB people who confirmed the distribution rate. And then they added this step: "You may be interested to know that August's subjects have been subjected to distribution rates of as much as 1,000G per second without detrimental results." DAA

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The other unit illustrated employs a small motor of 1/16 hp with integral gear reduction and a large 2 1/2 hp. motor with direct drive of 12,000 lbs. force.



TECHNICAL BULLETIN

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The EEMCO designs briefly described in this bulletin are a few of the more advanced units designed and produced during the last year in cooperation with leading aircraft manufacturers.

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CONVAIR'S PL. 11, WORTH PLANT is 5,000 ft. long. Assembly line starts lower left, completed B-36s emerge at upper right.

Convair Set to Turn Out B-60 on B-36 Line

Quick changeover to eight-jet production possible because 72% of parts identical to present bomber.

By Irving Sussman

It. Worth-Convair's giant eight-jet B-60 probably will be fabricated on the present B-36 line, if the company gets an initial production order for the new bomber. Adaptation of this production line for the B-60 should be made with little modification.

One of three eight-jet bombers, except for the Pratt & Whitney J57 engine installations, was completed last October, after a relatively brief eight-month period in Convair's experimental longer adjusted to the new plant. A second ship also is under construction, probably one of the near-completion stage. The first B-60 could have flown before January, 1957, Convair officials say, if engineers had been made available.

► **Build on Proven Base-**Reason for the quick fabrication job on the new plane is that about 72% of its parts are identical with those in the B-36. Detail parts for the B-60, except for some major units, were made up in the B-36 fabrication area from new detail tools to accommodate the changes made in

the transition from the long B-36 structure.

The speed program from the B-36 to the B-60 indicates a comparatively low cost for a new plane. Originally it was planned to make the aircraft in other models in the B-36 series, but a new designation was considered justified by the new configuration and greater performance—the B-60 should have about 30,000 lb. thrust available from six eight J-57's, as against the equivalent of about 42,000 hp. in the B-36.

► **Deliveries—**Finally, the fuselage of the B-60, from aft of the cabin to near the end of the tail, and also the center portion of the outer wing, remains the same as in the B-36.

The nose cone is lengthened to accommodate more equipment, and the tail cone is modified to house a landing chute and support a tail wheel.

At the extremity of the center portion of the outer wing a provision structure is needed to give sweep to the leading edge of the outer center section and outer panel. A rail on the center part of the center section also

traces the leading edge sweep to the fuselage. Also over the center part is another railing for the wing top surface.

The post structure for the J-57 on the B-60 is not used in the B-36. A new arrangement has been built for the J-57 installation.

► **Transcending Job—**Local orders for the B-60 are obtained, Convair continues to coordinate the B-36. Work effort on the B-36 fabricating this plane—and the B-60 will be in a similar production category—represents an extreme in aircraft construction. For the B-36 is the largest plane in production. It is an example on the aviation industry's long list production line.

Yet the flow and assembly scheme is a relatively simple one—the new main rail comes in at one end of the 5,000 ft. line, the finished plane comes out at the other end.

The superstructure of the fabrication job is driven house basically when you pass along the assembly stations and see the large diameter 50-ft. fuselage, the new wing that runs to a 74-ft. root thickness and stretches across 230 ft.

Essentially most of the problems involved in putting the new bomber together are similar to those encountered with other planes. Del-



LATEST FLIGHT VIEW of a Convair B-36, incorporating B-36, equipped with four jets, on prototype piston engines.



ALONG ASSEMBLY LINE—Mocking up B-60 fuselage sections together after they are taken from processing holes (top right). Subsequently and major assembly of B-60 fuselage by set shown lower left, and at lower right is a general view of nose forward fuselage by primary line, with photo endview assembly in background.



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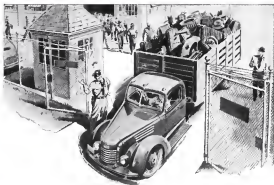


ELECTRICAL harness installation follows. Steps are being carried out.

Insurers are simply a matter of degree. The underwriting circle is larger, the greater number of ship-made parts (85,000) and difficult assemblies (3,500) for each plane add to the volume of trouble which would be normal for the industry.

► **Extreme Conditions**—But the committee knows how to get the B-36's blend of design and production in po-

color to this particular plane. Flight to an altitude of 50,000 ft (25 to 30,000 ft higher than for transports) is a relatively short time may be associated with a temperature change of 264°—and being severe problems calling for special design adjustments and production attention for almost everything that is loaded up to this length. Not only are there more parts and things in the B-36,



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The planes shown above are typical designs that incorporate Aerotec Automatic Controls. The Republic P-47 Thunderbolt, a combat plane, uses Aerotec pressure switches and a new dual float switch suitable for top or bottom mounted auxiliary fuel tanks. Boeing has long used Aerotec valves, float switches, and pressure switches on their transport planes.

When you are faced with problems of automatic controls for ships, landing gear and other better applications, fuel transfer, flow indication, etc., consult Aerotec. One of our cost-conscious specialists is near you, ready to give prompt and able assistance at any time. Call or write.

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test testing, retreating, painting, welding, etc.

From fabrication, most of the parts are lifted by elevators to a subassembly station, directly above. After working they are brought down by elevator or material, according to size of components, and moved directly to the assembly area where the subassembly is made.

Some of the subassemblies are moved forward to stockrooms serving the final assembly stations.

► 4,000-Lb. Line-From subassembly, to fabrication to major assembly the flow is across the width of the building to where the straight 4,000-lb. line begins, with major assembly in the center.

From here, the fuselage and wing components (nose, lower fuselage, horizontal and vertical stabilizers, and wing center section) go forward to major mating stations. Two of these stations are used, to speed the work and provide an incentive factor to pick up legs in production.

Major mating progresses onto the final assembly line, comprising 11 stations. Material is available to this, as the area for loading of components is installed on this line—airframe, armament, outer panels and engines (separate areas are used for mounting ducting and nacelles to get and push plates). In addition to these loading areas which serve right of the final assembly stations, parts come into the line from a subassembly parts warehouse. Receiving three final stations of the 4,000-lb. line are used for checks of the various systems—electrical, hydraulic, pneumatic, etc.—and Air Force production inspection.

► Check Station—From the assembly line, the B-36 is moved to various check stations—conductor for gas tank, after check, components, etc. engine room area for check of various wing component checks.

After this the plane goes to company flight, then is referred to steady conditions which were the subject of flight squawks. Next stop is to the AF as specified station, then to AF acceptance flight, which is followed by testing to meet equipment use for loads such as turret and engine covers, etc. Final stop is to delivery new for AF boys.

That's how Convair puts the B-36 together and gets it to the AF.

In this design and production effort at Ft. Worth, Convair employs more than 32,000 people, including the World War II peak figure—30,000—achieved in November, 1943, at the height of the B-24 effort. Of the present figure, about 2,500 are women, more than half of whom are in the factory, others in production control and testing. Ret workers represent an additional 10,000 full-time engaged in the B-36 effort.



JOY AXIVANE® AIRCRAFT FANS provide ice-protection for Parked Packets

The Fairchild Packet must be ready at all times to carry airborne troops or supplies in forward areas. The wings of parked aircraft, however, sometimes become coated with ice or frost which may literally stop them cold. To minimize this possibility, Fairchild engineers designed a forced hot-air system for wing-packet de-icing while the plane is on the ground. Two Joy AXIVANE Aircraft Fans supply combustion and venting air to eight 400-cfm STU houses. The heated air can be forced either into the wing panels or into the cargo and cabin space. No space is wasted by the fans, since their compact size permits them to be installed between the vertical fuselage lines.

Each of these highly-efficient 1.5 H.P. fans produces 1100 C.F.M. at 5" static pressure, weighs only 22 pounds and is only 9" in diameter. A & N design performance. Superior features of all Joy Aircraft Fans are compact design, shock-resistant strength, maximum operating noise, and the most favorable air volume-to-weight and electric-to-power ratios.

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Military Aircraft Roll Down the Lines



BOUND B-47 STRATOJET even component sections are arranged in double-deck assembly (left) to speed installation of complex systems and other equipment. The view from underneath one of the B-47's four major fuselage sections (right) shows the nose cap, head box and all sections. This view was taken at Wichita. Some sections of the big wing's leading-edge production now already may be ground from the fact that 12,000 parts go into the big plane, exclusive of costs, tools and engine components. New type of wing's internal and external fuselage box to be kept flat. Subcontracting accounts for about 40% of a dollar volume of the B-47's assembly. Wichita plant makes over 500,000 parts each section, all of wing except the section on the right.

YOUTHFUL CUTLASSER as seen on right) fuel assembly line at Dallas, which is housing and large number of the 700 high-class fighters for the Navy. The machine is made to performance over relatively dense World War II fighters. Dallas need for fine precision work, even on a production line basis. Necessity of transporting every major stress of equipment complicates the process. Small working space in a light-tube aircraft is still another major problem. Latest production version of the Cutlaser, the 77U, is powered by two Westinghouse J-45 gas-turbine engines. One of the most radical planes not ordered for squadron service, the Cutlaser type for the new high-performance fighters being prepared for carrier service with the fleet.



LOCKHEED T-33 jet trainers are completed (left) at Van Nuys, Calif. In production for three years, the two-place T-33 was to go on an active reserve, available for use. Jan. 2 is an attempt to meet the demand from USAF, Navy, Marine and at least five foreign air forces. The new production aircraft will provide specific savings of 40% in unit production costs, 25% in unit cost, 45% in support loading from reduction from 12 to seven in future-to-future incidents required among other benefits. Such gains are possible when sufficient orders are placed to permit major reorganization of production layout and use of new output techniques.

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EQUIPMENT



CUSTOMER view of Los Angeles Airways helicopter workshop shop.



MAIN ROTOR hub assembly of an LAA Sikorsky S-51.

LAA Uses Many New Operational Methods

Airline modifies its copters to meet needs; sets up a simplified system of maintenance routine.

By George L. Clayton

Los Angeles—"Operating a helicopter airline is comparable to running a hotel shop. There is no precedent to follow and you have to invent practically everything you do," Clarence M. Beltra says.

Beltra ought to know. He is president of Los Angeles Airways, first heli-copter airline in the world.

Currently delivering small and light-weight Sikorsky S-51 copters, the airline had to make several modifications to the basic machine to bring it up to maximum ability for each job or delivery operation. Here are some of the most important ones observed at the airline's main overhaul and repair base at Los Angeles International Airport.

- Exhaust system was moved to the right side of the helicopter to keep the exhaust fumes out of the main fuselage.
- Right fuel quantity gauge was about two-thirds the depth of the standard windshield. The transparent tube shows fuel quantity, points to—there are no moving parts to break down. This, incidentally, is an example of the positive approach and trend to simplification.

ity characteristic of Beltra's philosophy is to have an airline should operate. • Fuel booster pump modification turns the booster pump on automatically in case of minor engine fuel pump failure. This was deemed necessary because the pilot is so busy on takeoff that he should not be required to turn the booster pump on manually.

- Fuel transfer system has been installed to give the pilot more control over the fuel's center of gravity. CG is a critical problem in helicopter operation, according to LAA's officials. The new fuel tanks are located directly above and aft of the engine and transferring fuel from one to the other will have considerable effect on the CG.
- Cowling modification has changed original nacelle type from tie-rod type. Now any individual part may be removed without disturbing adjacent parts.

- "Bottle" modification expanded and capacity of the, after fuselage from a total of 145 lb. to two compartments with capacities of 100 lb. (upper) and 150 lb. (lower) respectively.
- Oil tank, battery and electrical control have been moved forward of the engine to give more space and take care of CG requirements.

- Flood and spotlights were installed to allow night land delivery. The flood lights on the helicopter's ground base, the spot lights over the pilot's head for the actual landing. Floodlights on the left main landing gear illuminate base and air traffic controllers.

- A flight recorder, made by Bendix and recording on film, is being tested experimentally to keep tabs on minor rotor spin. Tests are too new to pass completely.
- Tail rotor guards were installed to protect the anti-torque rotor from fences and other hazards.

• VHF radio has been installed. It allows the pilots to be in constant communication with LAA's operations office at Los Angeles International Airport.

- Maintenance Menckel-Beltra said that, after 12 years of work, he had perfected a maintenance system that was a model of simplicity and a university for its dissemination of such standard paper work.

It might be termed the "Kos" system.

The maintenance manual contains the most detailed description of each job to be done on the helicopter at a given time. But it goes one step further. Through a series of lines or symbols, currently M-I to M-18, each operation is tied in literally to an other action.

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ONE OF THREE S-11 copiers used by LAA to copy mail and maps in Los Angeles area

associated with that particular job.

For instance, when job M-1 is performed, the key M-1, that that operator to the accounting, engineering, housing and any other departments that might be concerned with job M-1. Then each job performed on the copiers is actually a copy of an individual handle, each held together by a key. And before keys are kept on every time of a working order by not allowing a single change to the manual without his personal OK.

Clear definition of duties allows one changes to make the manual, not of their time. As before put in "I don't want to waste my time" have been saying since last year.

As a matter of interest, and as a bonus of interest, the first way engine operators (and personnel) helicopter pilots, here are some (checked) boxes for the surface, engine and components as revealed by Harry Rotter, Supervisor of Inspection and S. E. Brown, General Maintenance Supervisor.

■ Inspection periods for the engine and airframe are: Top (per flight) daily, 40, 80, 120, 160. Airframe inspection is scheduled at 450 hr. for the airframe only.

■ Airframe major overhaul is set at 1,000 hr., the engine (R-915) 1,200 hr. Application is to be engine time on previous to 1,200 hr.

■ Main rotor head is examined at 240 and 480 hr., the main gear box at 500 with application for extension to 600 hr.

■ Main rotor have the same inspection periods as the airframe with a main rotor life of 1,200 hr.

■ Tail rotor are inspected at 480 hr. Average number of hours accumulated on the S-11s is date is 4,500.

■ No F-111s-Belton ground that his company "spends all its money on wages, materials and good equipment—

doesn't waste any on fancy stuff. We as a company organization, overhead could run it."

And a host of LAA's facilities confirmed the lack of fads. Maintenance shops were simply equipped, but as necessary, expensive equipment located in the inspection facility. Offices were simple. And an Edison Telephone number enabled one to get to handle the correspondence for his own plan handling the duties of secretary to the chief mechanic. LAA officials estimated the system saves them over \$500 a month.

■ On-Time Performance—One of Bell's leaders in having his egg brown, agents on schedule. To this end, an automatic flight timer is being kept in the shops. The device will turn on a light whenever a helicopter is due at a shop. Pilot's checking in by radio will enable the checker to tell at a glance how close to the all important schedule he is.

A 24 hr. rule around one of LAA's air mail routes showed how approach could, but actually how exacting and so time the operation is. The route leads from the L.A. airport to Compton, via several stops to Maricopa on the north; from Maricopa, via several more stops to Phoenix and Ontario to the north; from Phoenix, via several more stops to Kermode and Corona, then back to the airport.

In spite of the maximum stop, including one to take on fuel, the copiers were never appreciably off schedule and arrived at destination exactly on time.

The postage stamp use helicopters were located in various parts of Southern State were at small, private airports, a couple at first grounds, some in back yards, some in front of private homes of school play grounds.

Each helicopter is equipped with a standard wind sock. As high clouds



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